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The Files

29 August 1956

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Trip and Progress Report, ATP-3, Investigating the Use of Investment Castings

1. During the period of 21 August - 23 August, I visited four firms engaged in investment casting work to obtain cost and delivery estimates on various parts for the above project. The facilities of three of the plants were toured to determine their caliber of work and abilities, and also to familiarize myself with the processes. The plant of the fourth firm was located in a remote area and time did not permit close examination.

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stated that the case, cover, and the access port door were not, in his opinion, pieces suitable for investment casting. In our discussion of the remaining pieces he made the following observations:

- (a) On the frame block we could expect $1/2^\circ$ warpage on the upright sections and approximately .010" warpage across the bottom. (This amount of distortion can be tolerated). One thirty-second inch of material would be left on all surfaces of the recess of the bearing mounting block for finish machining; also, the same amount of material would be left on the lands for mounting the paper feed track. The motor clearance rabbet is the only hole that would be cast in the frame block. One thirty-second inch of material would be left in this rabbet for finish machining.
- (b) The bearing mounting block would have machining stock left on the thickness and width and would have the ink-roll holder clearance omitted from the top. All holes would be omitted from this piece.
- (c) On the ink-roll holder, [REDACTED] suggested the removal of the radius contour on the bottom for pattern making purposes and the addition of machining stock on the mounting surface. The original model is in two pieces. This would be cast in one piece.
- (d) On the cradle holding the clapper arm the pivot shaft hole would be cast in with .010" on the diameter for reaming, and the hold down screw clearance holes

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- (e) On the pressure roller housing the roller shaft hole would be cast with .010" reaming stock. All other holes would be left out. He suggested the removal of the radius on the bottom heel for pattern and die making purposes.
- (f) All holes would be omitted on the clapper arm with the exception of the spring seat.
- (g) The magnet clamp block would, in his opinion, be cheaper to machine from wrought stock than to cast.
- 25X1A5a1 (h) [REDACTED] pointed out that we could expect the following tolerances on all pieces:

<u>Piece Dimension</u>	<u>- Tolerance</u>
0 - 1/4"	.003"
1/4" - 1/2"	.004"
1/2" - 1"	.005"
1" - over	.005"/in.

These tolerances are necessary for allowances in the pattern and dies; however, the variation from piece to piece in the same lot would be much less.

- (i) The cost of tooling and casting on all pieces will be shown later in this report in tabular form.
- 25X1A5a1 (j) [REDACTED] recommended the use of 356-T6 Aluminum Alloy (Fed. Spec. QQA-601) as the appropriate material for our job. It has good strength and machineability properties.
- 25X1A5a1 (k) [REDACTED] suggested we send two sets of our final machining drawings with all surfaces to have material left on, as per our conversation, shown with a finish designation and/or notes.
- (l) They would be able to deliver samples eight weeks after receipt of order and the full order in two to four weeks after approval of samples.
- 25X1A5a1 (m) The writer toured the production plant accompanied by [REDACTED] who explained all the sequential steps and operations in the investment casting process. Their plant is compact, but not overcrowded, and is fairly clean. A large portion of their work is Armed

Forces sub-contract and commercial aircraft. Their pattern and die facilities are at another location with one diemaker at the production plant for die repair and maintenance. It should be noted that their dies are of a machined low carbon steel (cold rolled) construction for small orders such as ours and hardened tool steel construction for large orders.

- (n) They are contemplating consolidating their die facilities and production plant under one roof and have purchased a site for the new plant.

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stated that all of the pieces could be cast without difficulty, but that it was cheaper, in his opinion, to machine the magnet clamps block from wrought stock.

- (a) In our discussion he pointed out that the case could be cast complete with only the mating surface for the cover needing machining stock left on. The windows and large holes for bumpers would be cast.
- (b) The cover would be cast with the windows included, and machining stock would be left on the case mating surface.
- (c) The access port door would be cast complete without hinge holes. [REDACTED] felt it may be wise to leave machining stock on the two sides to insure a good fit with the door opening.
- (d) His recommendations on the frame block were the same as made by [REDACTED] except, that the motor clearance rabbet should be machined in complete.
- (e) The bearing mounting block would be cast as stated in paragraph 2 (b) of this report.
- (f) The ink-roll holder would be cast complete without the mounting hole with no need to remove the radius contour on the bottom.
- (g) The cradle would be cast complete minus all holes.
- (h) The pressure roller housing would be cast complete with all radii and minus all holes.
- (i) The clapper arm would be cast the same as in paragraph 2 (f), however, [REDACTED] suggested the addition of a shaft for greater strength.

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(j) All tolerances were the same as those shown in paragraph 2 (h) with a piece-to-piece variation of $\pm .002$ " on over-all dimensions.

(k) Cost estimates are shown in the table.

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(l) [REDACTED] also recommended the use of 356-T6 Aluminum Alloy (Fed. Spec. QQA-601).

(m) It was suggested that we provide two prints of our final machining drawing for each part. They would show where machining stock would be left, as per our conversation, and provide the finish designations and other essential notes. One drawing would be sent to us for approval and they would tool accordingly.

(n) Four weeks after receipt of the order they would supply samples on all pieces except the cover, case, and frame block. Six weeks would be required for these pieces. We could expect the order completed four weeks after approval of the samples.

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(o) A tour of the plant proved very similar to the previous tour. The [REDACTED] plant is compact, but not overcrowded, and very clean and orderly for this type of operation. A large portion of their work is Armed Forces sub-contract and commercial aircraft. Mr.

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[REDACTED] gave me a few parts from their aircraft jobs for use as representative samples of their work. They use a low fusing alloy die, moulded in pieces over a pattern for small orders, and a machined low carbon steel (cold rolled) die for large orders. They make their own short run dies and have the patterns and long run (machined) dies made externally.

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(p) The [REDACTED] firm is considering moving to a new plant, to be located on Long Island, for expansion purposes. The present plant is located on one floor of an office and industrial building in [REDACTED]

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During the afternoon of 22 August I visited the [REDACTED] 25X1A5a1
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Discussions were held with Mr. [REDACTED], head of the [REDACTED] department. [REDACTED] stated that all the pieces could be cast without difficulty; however, he was of the opinion that the magnet clamp block could be machined from wrought stock much cheaper than casting.

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- (a) Mr. [REDACTED] recommendations on the various pieces were practically identical with those of [REDACTED]
- (b) In discussing tolerances, [REDACTED] was desirous to have a minimum of $\pm .005$ " on over-all dimensions with $\pm .005$ "/in. for 1" and over. The piece-to-piece variation was $\pm .002$ " on over-all dimensions.
- (c) Estimated costs are shown in the table.
- (d) The use of 356-T6 Aluminum Alloy (Fed. Spec. QQA-601) was again recommended on all pieces.
- (e) He suggested the sending of two finish machining prints of all pieces. The prints are to show by finish designations and/or notes all surfaces to be machined. They would then mark both drawings, showing where machining stock would be left on and what holes would be deleted. One drawing would be sent us for approval.
- (f) Upon receipt of the order they would furnish three samples of each piece for approval. This would take a period of four weeks. It would take from six weeks to two months to complete the order after approval of samples.
- (g) I was unable to tour their plant since it was located outside the New York area. They have four plants over the country and their non-ferrous plant is in New Hampshire. They are considerably larger than the other plants visited and seemingly do a large volume of high production business. I was unable to determine what proportion of their work was Armed Forces sub-contract or commercial aircraft, but it appears that they do a large amount of straight commercial work. The tooling methods employed were primarily the same as the [REDACTED] plant.

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5. On the morning of 23 August I visited the [REDACTED] the company representative previously contacted by phone, was out of town. The plant was toured and discussions were held with the shop foreman. The plant was spacious and fairly clean. I was impressed by the complexity of a couple of the jobs under process. A major portion of their work was Armed Forces sub-contract or commercial aircraft. The tooling procedure was similar to the [REDACTED] firms with the patterns made on the outside and the dies of a low-fusing alloy made

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at the plant. He indicated that the tolerances were the same as those stated in paragraph 2 (h) of this report.

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- (a) He stated that the drawings necessary, and valid estimates of cost would have to be determined by [REDACTED] He did venture rough estimates on the cost and these are included in the accompanying table. He also stated that we could expect samples four to six weeks after receipt of the order and delivery two weeks after approval of samples.

6. Throughout the report I have referred to Armed Forces sub-contract and commercial aircraft work. Most of these orders or jobs require 100% X-ray inspection for quality as well as 100% dimensional inspection.

7. It is the opinion of this writer that all four companies are capable of handling the ATP-3 work, use practically identical methods, and have available reasonably similar facilities. Formal quotations from these firms, and the cost and time estimates of the remaining machine operations required to be done by the Laboratory, are factors now under consideration in determining the eventual suppliers.

8. The tabular compilations attached are tentative cost estimates subject to revision on the basis of finish drawings. It should also be noted that the battery case has not been included in these estimates. Dimensions on the battery case await the determination of the change required in the circuitry of the 12-volt temperature compensated unit. It will also be determined, on the basis of information now at hand, whether it is more economical to sand cast the large pieces with the additional machining required or to investment cast all pieces. The details of this study will be submitted with the final estimates on the system.

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Attachments (4)

Lab/DLC/rkb (29 Aug 56)

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